

STUDIES IN THE GENUS HEVEA VI

NOTES, CHIEFLY NOMENCLATORIAL, ON THE
HEVEA PAUCIFLORA COMPLEX

BY
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THERE has long been confusion and uncertainty in the taxonomic and nomenclatorial aspects of the study of the several concepts known as *Hevea Kunthiana*, *H. pauciflora*, and *H. confusa*. Recent studies in the field and in the herbarium have contributed much towards a clarification of some of the difficulties, but a more thorough understanding of the representatives of this complex, especially of those in British Guiana, would seem to be desirable. When further field work has been accomplished, I hope to present a detailed taxonomic study; but the need for an understanding of the proper names to use in this group is so urgent as to recommend the publication of our present knowledge of the nomenclatorial aspects of the problem without further delay.

Hevea pauciflora (*Spruce ex Benth.*) *Mueller-Argoviensis* in *Linnaea* 34 (1865) 203.

Siphonia brasiliensis Humboldt, Bonpland & Kunth
Nov. Gen. et Sp. 7 (1825) 171.

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Siphonia pauciflora Spruce ex Bentham in Hooker
Kew Journ. 6 (1854) 370.

Siphonia Kunthiana Baillon Étude Gén. Euphorb.
(1858) 326.

Hevea brasiliensis (HBK.) Mueller-Argoviensis in
Linnaea 34 (1865) 204, *pro parte*.

Hevea pauciflora (Spruce ex Benth.) Mueller-Argovi-
ensis * [forma?] *membranacea* Mueller-Argoviensis in
DC. Prodr. 15, pt. 2 (1866) 718.

Hevea membranacea Mueller-Argoviensis in Martius
Fl. Bras. 11, pt. 2 (1874) 299.

Hevea Kunthiana (Baill.) Huber in Bol. Mus. Para.
3 (1902) 349.

Hevea membranacea Mueller-Argoviensis var. *leiogyne*
Ducke in Arch. Jard. Bot. Rio Janeiro 6 (1933) 57.

Hevea pauciflora (Spruce ex Benth.) Mueller-Argovi-
ensis ssp. *typica* Ducke in Arch. Inst. Biol. Veg. Rio
Janeiro 2 (1935) 239.

Hevea membranacea Mueller-Argoviensis forma *leiogyne*
Ducke l. c. 239.

Hevea pauciflora (Spruce ex Benth.) Mueller-Argo-
viensis forma *tipica* Ducke in Bol. Técn. Inst. Agron.
Norte 10 (1946) 17.

Hevea pauciflora (Spruce ex Benth.) Mueller-Argovi-
ensis forma *leiogyne* (Ducke) Ducke l. c. 17.

For some time now it has seemed to me that one specific concept is involved in the two binomials, *Hevea pauciflora* and *H. Kunthiana*. Study of the type of *Siphonia Kunthiana* in the Paris Herbarium in 1950 has convinced me that this suspicion was well founded. A critical examination of the type collection, a unicate represented only in Paris, was necessary before coming to a definite conclusion, because the type of *Hevea Kunthiana* is completely sterile, and the description alone affords few definite characters. A brief survey of the

history of these two binomials may help to clarify my reasons for relegating *Hevea Kunthiana* to synonymy under *H. pauciflora*.

In 1858, Baillon (l. c. 326) pointed out that *Siphonia brasiliensis* K., based upon the collection *Bonpland 5022*, was not the same concept as *S. brasiliensis* Willd. He proposed a new name for the Kunth concept, publishing it as follows: “*S. Kunthiana* + = *S. brasiliensis* K. non W. (Coll. Bonpland, n. 5022).” In accordance with Article 44 of the International Rules of Botanical Nomenclature, we must consider this as a validly published name, for “the name of a species . . . is not validly published unless it is accompanied . . . by the citation of a previously and effectively published description of the group” Although Baillon did not refer to the Kunth description by the work and the page where it was published, there can be no doubt that his citing of Kunth as authority constitutes a citation of the actual description (Humboldt, Bonpland & Kunth *Nov. Gen. et Sp.* 7 (1825) 171).

The specimen upon which the Kunth description was based and which Baillon cites in his substitution of “*Siphonia Kunthiana*” for “*S. brasiliensis* K.” was collected in the upper reaches of the Orinoco in Venezuela and represents the same concept which was later collected by Spruce in the neighboring regions of the upper Rio Negro basin of Brazil and described as *Siphonia pauciflora*. This binomial and, more recently, *Hevea pauciflora* have gained wide acceptance, whereas *H. Kunthiana* has been largely ignored (Ducke in *Arch. Inst. Biol. Veg. Rio Janeiro* 2 (1935) 217), or relegated to synonymy with reserve under *H. brasiliensis* (Seibert in *Ann. Mo. Bot. Gard.* 34 (1947) 306). Ule (in *Engler Bot. Jahrb.* 35 (1905) 665) considered *Siphonia Kunthiana* a *nomen nudum*, and Pax (in *Engler Pflanzenr.* IV, 147 (1910)

128) followed him in this rejection of the name.

It is curious that Baillon failed to mention *Siphonia Kunthiana* in an article (in *Adansonia* 4 (1863-64) 284) which he published somewhat later than his proposal of the new binomial. This omission may possibly be attributed to the fact that the article in question dealt with the American *Euphorbiaceae* of eastern South America ("Brésil, Uruguay, Paraguay, Patagonia, etc.") and may not have been meant to include material from the Orinoco. Therefore, I do not believe that the omission has any real significance, especially since other species of *Hevea* (e.g. *Hevea guianensis* Aubl.) were likewise not included.

In 1865, Mueller-Argoviensis (in *Linnaea* 34 (1865) 204), when making the combination *Hevea brasiliensis*, considered *Siphonia Kunthiana* as a synonym of Kunth's *S. brasiliensis*.

In considering the problem of the real meaning of the binomial *Hevea brasiliensis*, Huber concluded (in *Bol. Mus. Para.* 3 (1902) 349; in *Rev. Cult. Col.* 10 (1902) 99; in *Bull. Soc. Bot. France* 49 (1902) 45) that the Orinoco material which Kunth had described as *Siphonia brasiliensis* should be called *Hevea Kunthiana*, and he accordingly made the indicated new combination from *Siphonia*.

Pointing out that the specimens which Kunth described as *Siphonia brasiliensis* were not referable to Willdenow's *S. brasiliensis*, Chevalier (in *Rev. Bot. Appl.* 16 (1936) 621) stated that their identity was still uncertain. He admitted the possibility that they may be referable to another Brazilian species already described, but he decided that, pending further material in flower and fruit from the original localities, it would be advisable to call it *Hevea Kunthiana* provisionally. Apparently unaware that Huber had made the combination in 1902,

Chevalier remade it. In a further discussion of the problem of the sterile Bonpland collection, Chevalier (l. c. 622) reported that it is very similar to *Spruce 2691*, the specimen upon which *Hevea pauciflora* and *H. membranacea* were based. The Paris material of *Spruce 2691* was annotated “*Hevea pauciflora* Muell.-Arg.?” by Hemsley and “*H. brasiliensis* Muell.-Arg.” by Poisson. Chevalier inclined to the belief that Hemsley’s opinion was correct, but he decided to conserve the name *Hevea Kunthiana*.

In 1906, Huber (in Bol. Mus. Para. 4 (1906) 622) did not feel certain enough to assign a position to *Hevea Kunthiana* in his scheme of the genus. He placed *Hevea Kunthiana* in his Series *Obtusiflorae* under “Incertae sedis” together with *H. nitida* and *H. viridis*, both of which were, like *H. Kunthiana*, based on sterile material. He further stated (l. c. 648) that *Hevea Kunthiana* was a very poorly known species in spite of the fact that it seemed to him to be a source of rubber, but that it was certainly different from *H. Benthamiana* of the same area. In 1913, Ule (in Engler Bot. Jahrb. 50, Beibl. 114 (1913) 17), who had previously dismissed *Siphonia Kunthiana* as a *nomen nudum*, employed the binomial *Hevea Kunthiana* in an enumeration of species found in the northern Amazon.

Most recently, Baldwin has discussed the application of the binomial *Hevea Kunthiana*. In 1947, he wrote (in Journ. Hered. 38 (1947) 55) that “specimens collected on the Orinoco by Aimé Bonpland and early confused with *H. brasiliensis* are possibly correctly referred to *H. pauciflora*,” in accord with Chevalier’s suggestion. Two years later, he definitely accepted this suggestion (in Journ. Hered. 40 (1949) 48); he took up *H. Kunthiana* “for the Orinoco plant, for the ‘seringa da serra’ of the upper Rio Negro, and for certain collections from British Guiana and Surinam.”

Before leaving our discussion of *Hevea Kunthiana*, we should consider the history of the binomial *H. membranacea* and of the various other combinations in which the epithet *membranacea* has been used. *Hevea membranacea* as a name has no biological significance whatsoever, for Mueller described the concept from the same collection (*Spruce 2691*) that was already the type of *H. pauciflora*. The epithet *membranacea* has, however, persisted in the literature and has been bandied about in the nomenclature to such an extent that much uncertainty might easily be experienced by rubber investigators who are not familiar with all of the intricacies of the problem.

The first published mention of the epithet *membranacea* was made apparently in 1866, when Mueller-Argoviensis (in DC. Prodr. 15, pt. 2 (1866) 718 wrote the following:

Ludit * *membranacea*, foliolis tenuiter membranaceis. [tree]. In Guyana anglica cum forma genuina speciei (Rich. Schomb. in hb. berol!). Haec praeter consistentiam foliorum nullo modo recedit.

It is not clear just what Mueller meant by the use of the asterisk, but it is important to attempt to clarify his meaning, if possible. This sign is not included in the enumeration of signs at the beginning of volume 15 of the Prodr. so it must have been used in a sense which, at the time, was widely understood. Mueller might have employed the asterisk to mean subspecies or variety, for it was often used during the 19th century to designate subspecific variants, especially subspecies. Persoon (*Syn. Plant.* 1 (1805)) was apparently the first to use it in this way. An example may be cited (l. c. 2 (1807) 41):

Mesembryanthemum 4. *linguiforme* α *scalpratum* Obs. Tres. sequentes tantummodo subspecies videntur: * *latum*, * *obliquum*, * *longum*.

Each of these subspecies is described. Another example from later in the century is that used by C. F. Nyman (*Consp. Fl. Europ.* 1 (1878) pg. ant. pg. 1):

Signa demum sunt explicanda, quibus subspecies, varietas, etc. indicandas utimur. Subspecies ideo (litteris minimis impressae) notantur asterisco (*), . . .

Nevertheless, the asterisk was also frequently employed to signify a subspecific variant of doubtful worth or the exact rank of which was uncertain. Persoon (*Syn. Plant.* 1 (1805) x) used it thus:

Speciebus obscuris, aut quoad sedum accuratori indagationi subjiciendis, signa crucis seu asteriscum apposui.

I believe that it is in this sense that Mueller used the asterisk, for we find a clear example of this use in Mueller's own writing (in *DC. Prodr.* 15, pt. 2 (1866) 749) under *Crozophora tinctoria* β *Hierosolymitana*:

Haec ludit * *brachypetala*, petalis florum foemineorum calyce paulo v. duplo imo 4-plo brevioribus.

In this case, we might call the variant a *forma* today; Mueller usually employed Greek letters for *varietas*, so that it is probable that he thought of the asterisk in this particular instance as a subvarietal variant or *forma*. This indirect evidence, coupled with his statement that the variant of *Hevea pauciflora* which he was calling *membranacea* "praeter consistentiam foliolorum nullo modo recedit" from the species, convinces me that the epithet *membranacea* was first published as a *forma*.

In his description of *Hevea pauciflora* forma *membranacea*, quoted above, Mueller based the concept on a collection made by Richard Schomburgk and preserved in the Berlin Herbarium. Then, a few years later (in *Martius Fl. Bras.* 11, pt. 2 (1874) 299) he raised the concept to specific rank under the name *Hevea membranacea*, giving a much fuller description. In so doing, he cited *Spruce 2691* as the only collection referable to *Hevea membranacea*; *Spruce 2691* was already the type of *H. pauciflora*! He failed to enumerate the Schomburgk

specimen under *Hevea membranacea*, but included it under *H. pauciflora*, referring to *H. membranacea* as “bene distincta.” He does not distinguish *Hevea membranacea* from *H. pauciflora* directly, but from groups of other species, and he fails to refer back to his 1866 publication of the epithet *membranacea*.

It appears that Huber (in Bol. Mus. Para. 2 (1897) 252) accepted *Hevea membranacea* as a good species, for he enumerated it amongst species which “probably” were used in the production of rubber. In 1906, however, Huber (in Bol. Mus. Para. 4 (1906) 620) apparently made no mention of *Hevea membranacea* in his synopsis of the genus. Ule (in Engler Bot. Jahrb. 50, Beibl. 114 (1913) 17) likewise listed *Hevea membranacea* as one of the species of the northern part of the Amazon. In 1910, Pax (in Engler Pflanzenr. IV, 147 (1910) 126) kept up *Hevea membranacea* as distinct from *H. pauciflora*, separating it from *H. pauciflora* in his key (l. c. 120) on only one character — the membranaceous consistency of the leaflets, but carefully pointing out (l. c. 118) through what limited material this concept was known.

In 1929, Ducke (in Rev. Bot. Appl. 9 (1929) 629; in Arch. Jard. Bot. Rio Janeiro 5 (1930) 156) listed *Hevea membranacea* as occurring in British Guiana and the northwestern part of the Estado do Amazonas in Brazil. Shortly thereafter, he employed this binomial (in Arch. Jard. Bot. Rio Janeiro 6 (1933) 56) to designate trees growing on granitic soil at São Paulo de Olivença on the Rio Solimões and along the Rio Uaupés. He also described (l. c. 57) the variety *leiogyne*, differing primarily in a minor character of the pistillate flower. In 1935, Ducke (in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239) reduced this variety to a form. In 1946, he reduced *Hevea membranacea* to synonymy under *H. pauciflora* (in Bol. Técn. Inst. Agron. Norte no. 10 (1946) 24) and

transferred forma *leiogyne* from *H. membranacea* to *H. pauciflora*.

Seibert (l. c. 300) reduced to synonymy under *Hevea pauciflora* not only *H. membranacea*, but also all of the several trinomials referring to the concept which Ducke has variously designated by the epithet *leiogyne*. A study of representative material both in the field (in the type locality) and in the herbarium convinces me that the distinguishing character given for the *leiogyne* concept is not sufficiently stable to warrant the creation of a distinct taxonomic entity.

Hevea pauciflora (*Spruce ex Benth.*) *Mueller-Argoviensis* var. ***coriacea*** *Ducke* in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239.

Hevea confusa Hemsley in Hooker Icones Plant. 26 (1898) 2, t. 2570; t. 2575, figs. 1-3, 12-13.

Hevea minor Hemsley l. c. 26 (1898) t. 2572.

? *Hevea camporum* Ducke in Arch. Jard. Bot. Rio Janeiro 4 (1925) 111.

Hevea humilior Ducke in Rev. Bot. Appl. Agric. Trop. 9 (1929) 624, 629, t. 18.

Hevea pauciflora (*Spruce ex Benth.*) *Mueller-Argoviensis* ssp. *coriacea* *Ducke* in Arch. Inst. Biol. Veg. Rio Janeiro 2 (1935) 239.

When Ducke described this subspecific variant of *Hevea pauciflora*, he pointed out that it "differs from *pauciflora* typica by the smaller size of all its parts, and by the thicker adult leaves which are rigidly membranaceous or (in the caatinga-vegetation of the upper Rio Negro) hardly coriaceous" [undoubtedly meaning "hard-coriaceous"]. Since its description by Ducke, this concept has been found to be relatively widespread and has commanded an appreciable amount of attention; the trinomial has been used in the literature (Schultes in Bot.

Mus. Leaf. Harvard Univ. 12 (1945) 10; *ibid.* 13 (1948) 117).

On a specimen of the collection *Richard Schomburgk 1381* preserved in the Paris Herbarium, there is an annotation of an unpublished binomial, under *Siphonia*, honoring the collector. The date and authorship of this annotation are unknown, but it represents apparently the earliest recognition of the concept as distinct from typical *Hevea pauciflora*.

In 1898, Hemsley described, after much study and hesitation, certain coriaceous-leaved specimens from British Guiana as *Hevea confusa*. Several of these collections (*Robert Schomburgk 817*, *Richard Schomburgk 1381*) had been cited by Mueller-Argoviensis (in *Linnaea* 34 (1865) 203; in *DC. Prodr.* 15, pt. 2 (1866) 717; in *Martius Fl. Bras.* 11, pt. 2 (1874) 300) as representing *Hevea pauciflora*, along with the type of this species (*Spruce 2691*); and Bentham himself considered these specimens to represent the same concept as the Spruce collection, for, in discussing *H. pauciflora*, he wrote that "apparently the same species is found also in British Guiana (Parker, and also Hancock in herb. Hook.—Robt. Schomburgk, 2nd coll. n. 817, Rich. Schomb. n. 1381)." I have spoken with botanists at Kew who conferred with Hemsley at the time he decided to publish *Hevea confusa* and have learned that he was not at all certain that he was dealing with a variant of specific rank. This is brought out in a report of a talk by Hemsley at the Linnean Society of London on April 4, 1901 (*Journ. Bot.* 39 (1901) 189: "It was formerly supposed that two species of *Hevea* might be distinguished in British Guiana, one (*Hevea pauciflora*) having thin leaves and a hairy ovary, the other thick, coriaceous leaves and a glabrous ovary, but, after examining a large number of specimens, Mr. Hemsley had come to the conclusion

that the differences were not constant, and that all the specimens exhibited might belong to one species and merely represented individual variation." This, incidentally, does not constitute a reduction by Hemsley of *Hevea confusa*, as Ducke (in Bol. Técn. Inst. Agron. Norte no. 10 (1946) 18) and Seibert (l. c. 301) have intimated; but it does indicate that Hemsley was uncertain. Uncertainty still persists. That the majority of the British Guiana specimens are different from typical *Hevea pauciflora* cannot be denied, but whether the difference is of a specific, varietal, or formal nature is the question.

In 1947, Seibert (l. c. 300) reduced *Hevea pauciflora* var. *coriacea* to synonymy under *H. pauciflora*, stating (l. c. 301): "The [*Hevea pauciflora*] complex has gone through various phases of taxonomic splitting, in which the Guiana material is usually considered as *H. confusa*. The Brazilian material from the Rio Negro and Solimões is referred to *H. pauciflora*, with coriaceous-leaved specimens as *H. pauciflora* var. *coriacea*. Although Hemsley described *H. confusa* as distinct from *H. pauciflora*, he later (1901) came to the conclusion that it was synonymous with the latter. More recently the feeling has been that *H. confusa* is synonymous with *H. pauciflora* var. *coriacea*."

Seibert stands alone in lumping together the coriaceous-leaved British-Guianan concept with the finer-leaved concept so common along the Rio Negro. He has pointed out (in Ann. Mo. Bot. Gard. 35 (1948) 120) that *Hevea pauciflora* is highly variable. It is true that there is a high degree of variability within this species over its widespread and disrupted range, but the two concepts in question are definitely distinct. This distinctness, recognized first in herbarium material by Hemsley, has been appreciated in the field by Ducke, Baldwin, and Schultes.

EXPLANATION OF THE ILLUSTRATIONS

PLATE LXXVII. HEVEA PAUCIFLORA (*Spruce ex Benth.*) *Muell.-Arg.* var. *CORIACEA* *Ducke* on the outskirts of Iquitos, Peru. This colony of trees appears to be that from which the type of HEVEA HUMILIOR *Ducke* was collected.

Photographs by RICHARD EVANS SCHULTES. *Courtesy of the Missouri Botanical Garden.*



In the upper Rio Negro, Baldwin (in Journ. Hered. 38 (1947) 57) noted the differences between the "seringa da serra" and the "seringa da caatinga," pointing out that "at São Gabriel on the Rio Negro one finds intergrades of the two": the former he called *Hevea pauciflora*, the latter *H. confusa*, thus intimating that the greater part of the British Guiana material and the "seringa da caatinga" of the Rio Negro belong to the same concept. He has continued to hold this opinion in later publications (Baldwin and Schultes in Bot. Mus. Leaflet, Harvard Univ. 12 (1947) 335).

After having spent a year in the upper Rio Negro valley and having studied material in American and European herbaria, I am of the opinion that: (1) the British Guiana material which Hemsley called *Hevea confusa* is, with some variability, the same concept as the "serra da caatinga" of the upper Rio Negro; that (2) these are varietally distinct from typical *Hevea pauciflora* known principally from rocky situations along the uppermost reaches of the Rios Negro and Orinoco; and that (3) they represent the same concept described by Ducke as *Hevea pauciflora* var. *coriacea*. While a full biological study of the *Hevea pauciflora* complex should await still further field studies, an examination of the available herbarium material brings into evidence the fact that differences do exist. Nevertheless, I have not found sufficient differences in floral or fruiting structures to warrant a specific rank. In 1948 (in Bot. Mus. Leaflet, Harvard Univ. 13 (1948) 117), I argued for the maintenance of a varietal rank pending further field studies. Ducke (in Bol. Técn. Inst. Agron. Norte no. 10 (1946) 18, 23) likewise has indicated his belief that the British Guiana material should be maintained as a variety, stating, however, that he was in doubt as to whether *Hevea confusa* should be kept up as a distinct variety of *Hevea pauci-*

flora or incorporated with *H. pauciflora* var. *coriacea*.

For many years, there has been some uncertainty as to just what the concept which Hemsley called *Hevea minor* represented. This species was based on a single specimen from the Río Casiquiare in southern Venezuela, preserved in the Kew Herbarium. During the greater part of the present century, the erroneous belief that *Hevea minor* and *H. microphylla* Ule were identical was accepted. A recent study (Schultes in Bot. Mus. Leaflet Harvard Univ. 13 (1947) 1) of type and authentic material has shown that *Hevea microphylla* is indeed distinct from *H. minor*. There still remained some doubt, however, as to whether or not *Hevea minor* represented a distinct species or a variant of some described concept. The paucity and apparent immaturity of the type and only specimen of *H. minor* made it unwise to conjecture. During the work in the upper Rio Negro basin in 1947 and 1948, I collected flowering and fruiting specimens from a number of caatinga-trees which are almost exact matches for the type of *Hevea minor*. One of these collections (Schultes & López 9489) came from a small tree at Cocuy, not far from the mouth of the Casiquiare and may, therefore, be considered almost topotypical; it is one of the collections most closely resembling Spruce 3457, the type of *Hevea minor*. I was unable to penetrate the Casiquiare itself, but many natives informed me that the riverside caatingas of the Casiquiare abound with this small rubber tree. It is found in abundance in most caatingas in the Rios Curicuriarí and the Uaupés, and upstream in the Rios Negro and Guainía. There is considerable variability in size of the trees, those growing in low-lying sandy caatingas which are flooded part of the year being extremely small, seldom exceeding fifteen feet in height.

The type of *Hevea minor* was in fruit and with seed.

EXPLANATION OF THE ILLUSTRATION

PLATE LXXVIII. Photograph of the type specimen of *Hevea minor* Hemsl., preserved in the Kew Herbarium.

PLATE LXXVIII



EXPLANATION OF THE ILLUSTRATION

PLATE LXXIX. Photograph of the type specimen of *Hevea camporum* Ducke, preserved in the herbarium of the Jardim Botânico de Rio de Janeiro.